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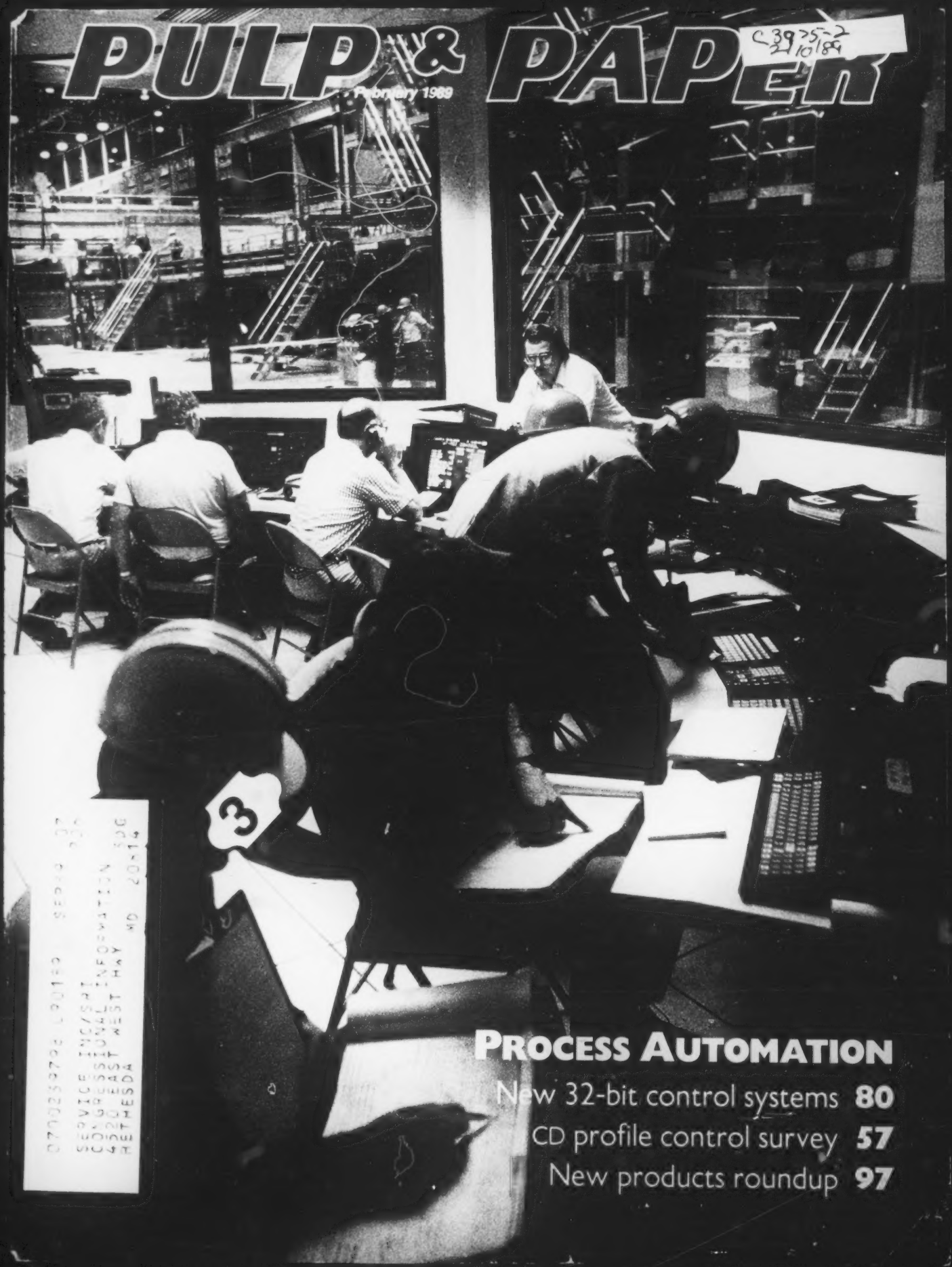
PULP & PAPER

February 1989



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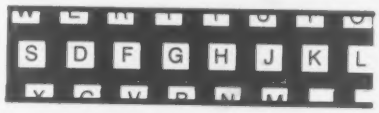

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PULP & PAPER (ISSN 0033-4081), with which is combined *Paper Mill News*, *Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office. POSTMASTER: Please send addresses changes to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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ABP

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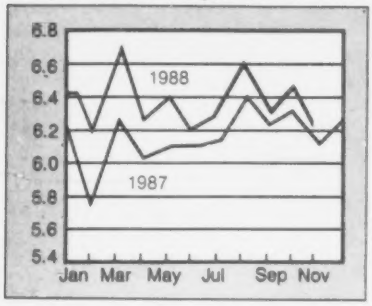
U.S. paper and board production



U.S. production of paper and paperboard totaled 6.21 million tons in November, up 1.3% from a year earlier, according to the American Paper Institute. While the growth trend rate remains flat, both paper and paperboard will easily set new production records for the year. Total production for 1988 will be in the neighborhood of 76.8 to 77.0 million tons, API reports, up at least 3.2% from 1987.

Among major grades, printing and writing papers continued to perform strongly, with production up 5.6% through November. Groundwood paper production climbed thanks to heavy demand from commercial printers, while coated papers continued to benefit from robust demand among magazine and book publishers as well as commercial printers. Recycled grades posted the best performance in paperboard. Containerboard production for the domestic market was up 2.2% through November, and fiber box shipments set a new record for the month.

Canadian newsprint shipments totaled 845,000 metric tons in November, up 5.5% from the previous year. Newsprint mills operated at 98% of capacity for the month. Woodpulp shipments totaled 683,000 tons, up 0.1%, with mills operating at 97%. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	Nov.	493	2.3	5,968	2.4
Uncoated groundwood (s)	Nov.	131	17.0	1,611	7.5
Coated paper (s)	Nov.	611	4.1	7,411	8.3
Uncoated free sheet (s)	Nov.	914	0.8	11,334	3.7
Other printing/writing	Nov.	128	9.4	1,532	11.1
Total packaging and other paper (s)	Nov.	424	1.2	5,197	2.7
Tissue	Nov.	455	2.9	5,488	3.7
Total paper	**Nov.**	**3,157**	**3.0**	**38,541**	**4.4**
Unbleached kraft paperboard	Nov.	1,509	-1.2	19,236	2.2
Semichemical medium	Nov.	475	3.7	5,706	1.6
Bleached paperboard	Nov.	361	4.6	4,475	1.9
Recycled paperboard	Nov.	714	-3.4	8,844	3.7
Total paperboard	**Nov.**	**3,058**	**-0.4**	**38,261**	**2.3**
Total U.S. paper and paperboard output	**Nov.**	**6,214**	**1.3**	**76,802**	**3.4**
PULP, WASTEPAPER & FIBER[2]					
Total U.S. woodpulp production	Oct.	5,078	0.2	61,132	2.7
Market pulp production	Oct.	646	-3.6	8,409	4.2
Wastepaper consumption at paper/board mills	Oct.	1,565	-3.3	18,830	2.9
Pulpwood consumption (cords)	Oct.	7,908	-1.0	95,294	1.3
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	Nov.	24.876	6.5	283.909[6]	3.4
Containerboard inventories at U.S. box plants and mills	Nov. 1	2,527	7.4		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	Oct.	1,044	-5.0	12,853	2.9
Imports of Canadian newsprint	Oct.	680	-4.2	8,497[6]	-1.5
U.S. paper exports (including products)	Oct.	426	2.7	5,556	6.7
Exports of unbleached kraft linerboard	Oct.	143	-14.9	2,145	-3.9
Exports of woodpulp	Oct.	421	26.4	5,443	13.4
Norscan pulp inventories[4]	Nov. 30	836	-8.2		
Norscan pulp operating rates[4]	Nov.	99%	91%	94%	98%
CANADIAN STATISTICS[5] *(reported in metric tons)*					
Total newsprint shipments	Nov.	845	5.5	8,993[6]	1.2
Operating rates	Nov.	98%	99%	99%	98%
Inventories held by U.S. consumers	Nov. 30	1,431	-0.8		
Other paper/board shipments	Nov.	547	0.0	6,115	4.3
Woodpulp shipments (export only)	Nov.	683	0.1	7,379	1.0
Operating rates	Nov.	97%	98%	96%	96%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Kraft linerboard: Market should be in balance—but no longer tight

Grade structure: Unbleached kraft linerboard is made in a wide range of basis weights. Standard weight in the U.S. is 42 lb/1,000 ft², but other important weights are 26 lb, 33 lb, 69 lb, and 90 lb/1,000 ft². Major end use is in domestic corrugated container production, although about 13% of output is exported. Specialty grades include mottled white, solid white, and wet strength-treated board. Recycled linerboard production has grown close to 500,000 tpy but is not included.

Production: The U.S. linerboard market began to ease in the second half of last year due to slower corrugated box cutup, sluggish linerboard export shipments, and a high underlying rate of industry capacity growth.

After rising 4.5% in first-half 1988, box shipments were up only 1.6% in the third quarter from a year ago. Shipments picked up slightly in the fourth quarter and were up about 2.8% for all of 1988. U.S. linerboard export shipments were relatively flat in 1988 at around 2.3 million tons. This mainly reflects a roughly 40% drop-off in shipments to People's Rep. China, a major customer that ordered heavily the previous year.

Signs of a supply imbalance became apparent in rising inventories at box plants and mills during the summer months. Some U.S. producers also tried to push tonnage in export markets using spot discounts, which resulted in an erosion in overall export price levels. Helped by maintenance downtime, inventories were reduced later in 1988, down to about the same level as at the start of the year. For all of 1988, U.S. linerboard production was up about 2.1% to just under 18.0 million tons.

Capacity trends: The high rate of industry capacity growth mainly has been due to incremental expansion projects, such as addition of high-pressure press sections. In addition, there probably was some shift of capacity from unbleached kraft paper to linerboard production.

The extent of the capacity "creep" was reflected in the recent American Paper Institute survey, which showed the industry capacity base had jumped 3.7% to 18.6 million tons in 1988. (This was 542,000 tons higher than reported in the previous year's survey for 1988.) The new API survey shows that capacity will rise by 2.5% to 19.08 million tons in 1989—but this has been adjusted upward in this forecast by 250,000 tons to reflect additional unreported capacity expansion.

Only two new linerboard machines have been announced: a 350,000-tpy machine at Gaylord Container Corp.'s Bogalusa, La., mill for startup in 1990 and another for Union Camp Corp.'s Savannah, Ga., mill, which will result in a 235,000-tpy net capacity increase after shutdown of an existing machine. In addition, Mead Corp.'s new 420,000-tpy clay-coated natural kraft board machine at Mahrt, Ala., may initially produce some linerboard following startup in 1991.

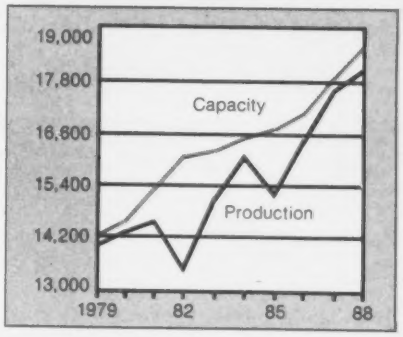
Future outlook: Corrugated box shipments are forecast to rise about 2.5% in 1989, based on about 2.8% growth in real GNP and 3.5% growth in industrial production. Linerboard export shipments are forecast to be up 4% to nearly 2.4 million tons, helped by continued weakness in the U.S. dollar and strong corrugated box cutup in Europe and the Far East.

Total production of linerboard is projected to rise 2.1% to 18.3 million tons. Based on the adjusted capacity base, this would result in an operating rate of 94.9% in 1989, down from 96.5% in 1988 but still a fairly well-balanced market.

Prices: The last $30/ton linerboard price increase to $410/ton took place in March 1988. Several producers have announced a $30 to $40/ton price increase for early 1989, but it is likely that the increase will not take hold until March or April. The increase probably marks the peak in the current market cycle and may not hold if the economy begins to weaken later in the year.

Historical year-end prices for 42-lb linerboard delivered in the eastern U.S. open market: 1988, $410; 1987, $380; 1986, $320; 1985, $250; 1984, $350. (For more detailed statistical information, see the *Pulp & Paper 1988 FactBook*.)

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

	1987	1988	1989e
Production	17,682	17,965	18,340
Capacity	17,949[1]	18,613[1]	19,334[2]
Utilization rate	98.5	96.5	94.9
Imports	81	83	78
Exports	2,297	2,300	2,390
Apparent U.S. consumption	15,466	15,748	16,028
lb/capita	126.8	128.0	129.2
GNP ratio[3]	4.02	3.94	3.91

e = Estimate.
1. Based on 1988 American Paper Institute capacity survey.
2. Revised upward by 250,000 tpy to reflect shift of capacity from kraft paper production. Adjustment also reflects capacity expansion beyond what was reported in the 1988 API survey.
3. 1,000 tons/billion $ real GNP.

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity	Market share (%)
1. Stone Container[1]	2,535	13.5
2. International Paper	1,700	9.0
3. Weyerhaeuser	1,480	7.9
4. Union Camp	1,320	7.0
5. Georgia-Pacific	1,300	6.9
6. GN Nekoosa	1,220	6.5
7. Temple-Inland	1,195	6.3
8. Jefferson Smurfit[2]	860	4.6
9. Willamette	810	4.3
10. Pkg. Corp. Amer.	750	4.0

Market share of top five companies:
44.2%

Market share of top ten companies:
59.9%

Total U.S. capacity (1988 year-end):
18.842 million short tons

1. Includes 49% stake in Seminole Kraft Corp.
2. Includes 50% of Container Corp. of America.

MARKET PULP

Crestbrook to build 500,000-tpy pulp mill

Crestbrook Forest Industries Ltd. announced that it will build a 500,000-metric-tpy greenfield kraft pulp mill about 50 km northeast of Athabasca, Alta. The mill will produce about 80% bleached hardwood kraft pulp from aspen and 20% softwood pulp when it starts up in late 1991. The company plans to integrate the mill with a paper machine in the mid-1990s. The entire project is expected to cost C$1.3 billion. Crestbrook beat out Weyerhaeuser Co., which also wanted timber to construct a kraft pulp mill.

Crestbrook has formed a company, Alberta-Pacific Forest Industries Inc., to build and operate the mill, which has been awarded timber harvesting rights amounting to 3.2 million m^3/year. Alberta-Pacific is a subsidiary of Crestbrook, which in turn is 64% jointly owned by Mitsubishi Corp. and Honshu Paper Co. of Japan, with the rest held by Canadian investors. This is the second major investment in Alberta by the Japanese (Daishowa Paper Manufacturing Co. is building a bleached kraft pulp mill near Peace River that is scheduled to start up in 1990).

The new mill will be the largest single-line pulp mill in the world, according to Crestbrook. Production will increase to more than 1,800 air-dry metric tons when the paper machine is fully operational. A spokesmanfor the company said that the paper mill will produce fine writing paper grades, including facsimile paper and computer printout paper. The paper mill is expected to start up in 1995 at the earliest.

The province of Alberta will contribute $75 million for infrastructure cost and a maximum debenture of $300 million to be repaid under a preset plan. Half of the $300 million will go to the pulp mill, and a maximum of $150 million will go to the paper mill. The cost of constructing a greenfield paper mill at the site is estimated at $300 million. About 200 direct jobs will be created when the paper mill starts up.

Alberta-Pacific must file an Environmental Impact Assessment. After this has been approved, construction can begin. The company anticipates that construction will start in spring of this year. According to new regulations promulgated in Alberta, the mill is required to install an oxygen delignification system and must also construct an onsite chlorine dioxide generator.

Alberta-Pacific and its woodlands will create 1,300 direct jobs and 2,600 indirect jobs. The company has chosen Stanley Associates Engineering Ltd., Alberta, to perform the engineering. H.A. Simons Ltd. performed the preliminary engineering. Alberta-Pacific's head office will be located in Edmonton, Alta.

Crestbrook runs a 175,000-metric-tpy bleached kraft market pulp mill in Skookumchuck, B.C., four sawmills in the province, and one plywood plant in Alberta. Currently, it exports 60% of its pulp and 90% of its lumber to the U.S., and it is expected that a lot of the output from the new paper mill will also be sold in the U.S.

Sawlogs harvested by Alberta-Pacific will be made available to local sawmills. The mill will buy woodchips from local operators and will also run its own woodyard.

Separately, a sawmill was awarded some cutting rights in the area. Northem Industries plans to construct a C$16-million specialty hardwood sawmill in Lac la Biche, Alta., with capacity for about 70 million bone-dry ft of hardwood lumber. The sawmill will probably supply Alberta-Pacific with aspen chips, and it could additionally supply Millar Western Pulp Ltd.'s bleached chemi-thermomechanical pulp mill at Whitecourt, Alta. The mill will employ a total of approximately 140 people when it starts up in December. Most of the lumber will be exported to Europe and Asia.

Public involvement is encouraged. Alberta is introducing a program that is aimed at keeping the public involved in the major forestry projects in the province. It is sponsoring a series of open houses that are designed to provide interest groups with an opportunity to voice their concerns about the projects to the government, the company, and the public. These open houses will be held in the local communities that will be affected by the expansions. Environmentalists are upset with Alberta-Pacific's plans to construct a bleached kraft pulp mill that will discharge into the Athabasca River, as do Procter & Gamble Cellulose Ltd.'s mill in Grande Prarie and Weldwood Ltd.'s mill in Hinton. ■

Major Alberta pulp and paper projects.

Company	Cost (C$ million)	Capacity (000 metric tpy)	Startup date
Alberta-Pacific, Athabasca	$1,300	496 BSK/BHK	Late 1991
Daishowa Canada, Peace River	500	340 BHK	1991
Weldwood of Canada, Hinton	393	214 BSK	Late 1989
Alberta Newsprint, Whitecourt	360	220 newsprint	1990
Millar, Western Pulp, Whitecourt	205	210 BCTMP	Aug. 1988
Procter & Gamble, Grande Prairie	400	15[1] BSK 250[2] BSK/BHK	1991 1992
Alberta Energy Ltd., Slave Lake	168	110 BCTMP	Late 1990

1. Incremental expansion.
2. P&G can expand second mill to 300,000 tpy.
Source: Alberta Forest Industry Development and *Pulp & Paper Week*.
BSK=Bleached softwood kraft. BHK=Bleached hardwood kraft pulp. BCTMP=Bleached chemi-thermomechanical pulp.

E.B. Eddy Forest Products to sell Eastern Fine Paper Div.

E.B. Eddy Forest Products Ltd., Ottawa, Ont., has signed a letter of intent to sell its Eastern Fine Paper Inc. Div. in Brewer, Maine, for an undisclosed amount. The intended purchaser is Preco Corp., Amherst, Mass., which owns Lincoln Pulp & Paper Co. Inc., an integrated pulp, paper, and tissue maker.

Eastern produces about 180 tpd of sulfite and cotton fiber printing/writing and uncoated and coated specialty paper. The Lincoln mill makes about 170 tpd of uncoated communication and printing paper and 100 tpd of toilet and facial tissue and napkin stock.

In a public statement, Preco president J.H. Torras said the two mills would retain their individual identities. Eastern president Bruce Hamilton and Lincoln president Robert Ackerman will remain at their posts.

Meanwhile, Eddy has indicated that it will not close down the remainder of its mill at Hull, Ont., if Scott Paper Ltd. acquires its White Swan Div. Eddy will retain ownership of all the land in the area and will continue to operate the 260-tpd fine paper operation at Hull, the lower mill steam plant, the filtration plant, and the clarifier. In a letter to employees, J.A. Pickard, E.B. Eddy senior vice president-paper manufacturing, said that the discussions with Scott are "at a preliminary stage and it will be some time before a final agreement is concluded." The White Swan Div. has capacity to produce about 220 tpd of tissue products. Scott said it does not plan to move Hull's tissue operations to another location if the acquisition is successful. ■

Hanson sells Allied Paper units, keeps Kalamazoo mill

Hanson plc will sell Allied Paper Inc. and its business forms operations to Allied Acquisition Inc., a newly formed company organized by a private investor group and certain Allied senior management, for $56 million.

Included in the sale are the SCM Allied/Ergy business forms converting plants and SCM Walton Printing. Hanson will retain control of the 425-tpd printing and specialty papers Allied Paper mill in Kalamazoo, Mich. and SCM Office Supplies and Histacount, another business forms unit. ■

CAPACITY EXPANSIONS

U.S. paper/paperboard capacity to rise

The U.S. paper industry will increase manufacturing capacity for primary paper and paperboard by 8.2 million short tons during 1989-91 for a 3.3% average annual gain, according to the American Paper Institute's 1988 annual capacity survey. During the same period, woodpulp capacity will increase by 5.1 million tons for an annual growth rate of 2.6%. These planned expansions will raise total paper and paperboard capacity to a potential 88.6 million tons by 1991 and industry pulp capacity to 67.8 million tons. Wastepaper consumption is projected to increase about 3.0% annually to reach 23 million tons by 1991, assuming that the industry continues to operate near full capacity.

For the second consecutive year, producers revised their expansion plans upward to reflect strong, sustained demand for the industry's products. For the period 1988-90, planned capacity additions increased by 18.0% since the 1987 survey. The 3.3%/year growth rate in paper/paperboard capacity over the next three years that was projected in the latest API survey compares with a 2.5%/year rate in last year's survey.

High industry profitability is fueling an unprecedented capital spending boom in both the U.S. and Canada, which will lead to the largest influx of new capacity in history. Fears that this North American expansion boom will coincide with an economic downturn and lead to overcapacity were downplayed by analysts, with the exception of market pulp and newsprint.

A looming oversupply of newsprint has already given newspaper publishers the leverage to delay the timing and amount of the next newsprint price increase. Some analysts also predict an oversupply of market pulp in 1991 or 1992 if all proposed worldwide pulp expansions are completed on schedule. Some 40 major market pulp projects with a combined total capacity of 8.0 million metric

Growth trends in U.S. capacity (000 short tons).

	Additions 1979–88		Additions 1989–91	
	10-year increase	Average annual growth	3-year increase	Average annual growth
Total all grades paper paperboard	**15,016**	**2.0%**	**8,266**	**3.2%**
Total paper and paperboard	17,223	2.4	8,249	3.3
Total paper	9,739	2.8	4,432	3.5
Newsprint	2,012	4.1	1,001	5.2
Printing/writing	7,498	4.0	2,823	3.9
Packaging and industrial converting	(752)	(1.3)	137	0.8
Tissue	982	1.9	470	2.7
Total paperboard	7,485	2.1	3,817	3.1
Unbleached kraft	5,120	3.0	2,423	3.9
Solid bleached	482	1.1	306	2.1
Semichemical	1,057	2.0	573	3.2
Recycled	826	0.9	515	1.8
Construction grades	(2,207)	(6.9)	17	0.3
Total all grades woodpulp	**10,864**	**1.9%**	**5,143**	**2.6%**
Total woodpulp[1]	11,888	2.1	5,078	2.6
Dissolving and special alpha	(172)	(1.2)	1	—
Sulfite	(506)	(2.7)	2	—
Sulfate and soda	10,528	2.5	3,885	2.6
Semichemical	202	0.4	298	2.0
Mechanical	1,835	3.4	893	4.4
Construction paper and board	(1,024)	(7.3)	65	2.3

1. Excluding pulp for construction paper and board.
2. Includes screenings. ( ) = Decline.
Source: American Paper Institute.

tons have been announced to date.

Pulp boom spurs expansion. High market pulp prices have prompted the wave of pulp expansions, either to increase capacity for internal use and reduce outside purchases or to provide tonnage to sell on the open market. Capacity for bleached and semibleached softwood grades will increase by 960,000 tons, while hardwood grades will increase by 1.36 million tons. Capacity for unbleached grades will increase by 1.6 million tons. Major expansion projects include new pulp mills by Bowater Southern Corp. at Calhoun, Tenn., and Weyerhaeuser Co. at Columbus, Miss. Over 100 expansion projects are scheduled.

Mechanical pulping capacity, including thermomechanical pulp and chemi-thermomechanical pulp, will increase by 1.191 million tons during 1989-91.

As part of the overall pulp expansion, capacity growth for U.S. market pulp will average 1.9% annually during 1989-91, after increasing 5.8% in 1987 and 4.4% in 1988. Market pulp capacity will increase by 525,000 over the next three years, raising industry capacity to 9.403 million tons in 1991.

Wastepaper consumption at U.S. mills is expected to reach about 23 million tons in 1991 if the industry operates at full capacity.

Newsprint oversupply. Most of the industry's major capacity expansions are scheduled to start up in 1990 and 1991, but new newsprint capacity will begin coming online in 1989-90, even as newspaper markets are weakening. Three new greenfield mills with total capacity of 665,000 tpy will be constructed. During the same period, Canadian producers plan to increase their newsprint capacity from 11.2 million tons in 1988 to 12.8 million tons in 1991 with the addition of six new machines.

Printing/writing more balanced. Among other paper grades, the printing/writing grades will add 2.823 million tons of capacity during 1989-91, averaging 3.9% annual growth. Uncoated free-sheet, the largest printing/writing category, will provide 1.283 million tons, or 45% of the total expansion.

Capacity for coated free-sheet, a much smaller grade category, will increase by nearly 1.0 million tons. Coated groundwood capacity will increase by 328,000 tons to 4.7 million tons by 1991. This 3.4% annual growth rate is more than double the historical 1.6% growth rate. The major project is a 220,000-tpy machine at Blandin Paper Co.'s Grand Rapids, Minn., mill. Uncoated groundwood paper, which includes supercalendered paper, will add only 179,000 tpy of capacity, well below its 6% annual rate of growth to date. Most of the capacity expansion is accounted for by Daishowa America Co.'s Port Angeles, Wash., mill.

Capacity for tissue paper will grow at a 2.7% average annual rate as a result of the installation of five new machines between 1989 and 1991.

Linerboard rebuild plans add up. Among the paperboard grades, unbleached kraft linerboard capacity will show the largest gain—3.9% annual growth—in 1989-91, increasing from 18.613 million tons in 1988 to 20.783 million tons in 1991. Only two new linerboard machines are planned.

• *Copies of the Capacity Survey are available for $300 each domestically and $325 overseas from the Capacity Dept., Box SM, American Paper Institute, 260 Madison Ave., New York, N.Y. 10016.* ■

LABOR

Smurfit Newsprint locks out strikers

In January, Smurfit Newsprint Corp. locked out the 480 members of the Assn. of Western Pulp & Paper Workers who have been striking its Oregon City and Newberg, Ore., newsprint mills since last July. The union notified the company Jan. 3 that workers would return to work unconditionally. A Smurfit spokesman said that the company declined the offer, citing acts of sabotage and vandalism during the strike as well as the possibility of another strike if the workers returned to work without a contract. The spokesman said the company has hired temporary employees but legally cannot hire any permanent employees as long as the mill is in a lockout situation. A Dec. 28 meeting convened by the federal mediator ended without progress, and no further meetings have been scheduled. ■

IP's Texarkana mill signs new labor agreement

About 664 United Paperworkers International Union and International Brotherhood of Electrical Workers members signed agreements with International Paper Co.'s Texarkana, Texas, 1,300-tpd bleached board and market pulp mill. The UPIU contract calls for a lump-sum payment in the first year ranging from $500 to $1,100 and wage improvements of 2% in both the second and third year. In addition, shift production workers will receive a pay hike of 25¢/hour in the first year. The agreement with IBEW members calls for a lump-sum payment in the first year of $1,000 and a general wage increase of 2% in both the second and third years.

Meanwhile, members of the Assn. of Western Pulp & Paper Workers voted down a contract offer at IP's Gardiner, Ore., mill in December, and no further meetings are slated. The mill has been running under an implemented contract since January 1988.

• About 1,100 AWPPW members settled a new three-year contract with Scott Paper Co.'s Everett, Wash., mill. A company spokesman said the heart of the agreement is the inclusion of a clause establishing a cooperative effort between management and labor to address work rule flexibility changes.

• A new three-year contract has been settled by Container Corp. of America, Brewton, Ala., and about 495 UPIU, IBEW, International Assn. of Machinists & Aerospace Workers, and United Assn. of Journeys & Apprentices of Plumbers & Pipefitters union members. According to the agreement, workers will receive a lump-sum payment in the first year and general wage increases of 2.5% in the second year and 2% in the third. Premium pay for Sunday work was eliminated.

• Three international unions representing 13,000 Weyerhaeuser Co. workers have formed a joint council to develop contract negotiating strategies and strengthen their bargaining position. The council's first task will be to build and implement a plan to assist a UPIU local in Valliant, Okla., where workers are currently negotiating at Weyco's linerboard mill. The three unions making up the joint council are UPIU, the United Brotherhood of Carpenters, and the International Woodworkers of America. ■

SSL supply up, consumption steady; vanillin expansions on line

PRODUCTION. Sulfite pulping operations across North America are sharing in the good fortune of the pulp and paper industry. In 1988, overall production of sulfite pulp increased by 7% in the U.S. and remained flat in Canada. The capacity situation is similar, but there is some speculation about closure of some older mills in the Midwest and eastern Canada. This has been good news to the producers of sulfite byproducts, who are enjoying flat or steady growth in most business areas. Spent sulfite liquor (SSL), the chief raw material for most products, is in plentiful supply and at a fairly cheap cost to consumers.

The most significant sector of the sulfite byproduct market is in vanillin production. Closure of the world's largest vanillin facility, owned by Ontario Paper in Thorold, Que., and its subsequent dismantling left options open to the other major producers. The response came quickly, as both ITT Rayonier and Rhone-Poulenc announced and pursued expansion plans. Rayonier has doubled its existing facility in Hoquiam, Wash., bringing capacity to 1,500 metric tpy. The expertise of the company's research center and the available raw material from its pulp mills made the project viable.

Rhone-Poulenc is going ahead with a new plant to be constructed in Baton Rouge, La. at an approximate cost of $100 million. The plant will be sized to accommodate 2,000 tpy or more and will be operational sometime next year. Both expansions more than cover the gap created by Ontario Paper's closure.

In other business news, the Japanese papermaker Daishowa bought Reed Lignin and Reed Paper. No changes seem likely since the company receives its raw material from the mills in Canada.

The pulp and paper market's general strength has helped with the supply of raw materials. The overall increase in pulp production provides for softer pricing and greater availability and allows more scrutinized source selection. Ontario Paper's chemical plant closure decreased overall consumption of raw materials in 1988. Producers expect no real change in business conditions this year, with volume remaining flat and prices just as soft.

END-USER MARKETS. The vanillin market is growing a few percentage points per year in the food and fragrance sectors, but the real growth will appear offshore. But prices are firm and should stay that way until the new Rhone-Poulenc plant comes online. Imported material has not experienced much growth, hurt by a falling dollar and domestic production growth.

In the lignosulfonates market, the waters are a bit choppy. Oil drilling is still not back to where it was ten years ago in western Canada and the U.S. Southwest, but the price of crude is inching upward and there have been more meaningful meetings between OPEC members. Even the Texas Railroad Commission is participating in the process again after a two-decade hiatus. The construction market is steady, although compared with 1988, a few less homes and commercial buildings will be built. Creeping interest rates are the chief reason for that forecast.

The drought had a terrible effect on agribusiness in both the U.S. and Canada. Herds were slaughtered and crops were harvested before their expected times. As a result, the animal feed business suffered, but it should bounce back in 1989. The $130-million beef export market that has been threatened by the recent European ban will not significantly change the forecast picture.

Other specialty areas have fared well. The markets for road clearance, chemical intermediaries and dispersants are all jockeying for position against other products but seem to be holding up.

Table 1: **Sulfite pulping production has not had a great affect on SSL consumption (bleached and unbleached, 000 tons).**

	1980	1985	1988	% annual growth
U.S. (short tons)	1,860	1,560	1,565	−2.7%
Canada (metric tons)	2,168	1,598	1,750	−1.9%

Table 2: **Outlook for major categories of SSL products.**

Lignosulfonates	Production	Consumption	Price
Commodity	Uncharged	Mixed	Mixed
Specialty	Increasing	Upward	Flat
Vanillin	Strong increase	Steady	Upward

SURVEY SHOWS MORE THAN 3,000 CROSS-DIRECTION CONTROLS NOW INSTALLED

Suppliers continue to offer new actuators and more sophisticated control software and integration with distributed control systems

By KENNETH E. SMITH, Executive Editor

Cross-direction (CD) paper machine control systems continue to be installed at a rapid pace by an industry striving to obtain higher quality in its products. A *Pulp & Paper* survey (*P&P*, Mar. 1987, p. 48.) showed that 1,847 CD actuators had been installed under closed-loop control through the end of 1986. A more recent survey found that number had increased by almost 67% to 3,079 by the end of 1988. Overall, the number of CD actuators under control in the industry has nearly tripled since *P&P*'s first CD survey at the end of 1984 (*P&P*, Feb. 1985, p. 72.), indicating their rapid acceptance.

Despite the strong growth in the number of new CD installations, the market seems far from saturated. The major players in the CD control market have introduced a number of new actuators, software systems, and sensors to enhance their product lines since the last survey. Two major control systems suppliers, Measurex and AccuRay, have complemented their lines of actuators. Two companies previously known primarily as actuator suppliers—Impact Systems and Devron-Hercules—now offer control software/architecture (and, in Impact's case, sensors as well). Measurex, AccuRay, Impact, and Devron-Hercules all now sell basis weight, moisture, and caliper actuators. In addition, all report CD coat weight and gloss/smoothness control abilities.

These companies have placed major emphasis on developing improved software to control the actuators, i.e., for decoupling adjacent control zones, "mapping" the sheet profile and correlating control of individual actuator control zones, and coordinating the actions of multiple actuators. Another major trend has been the attempt to move both machine-direction (MD) and CD controls away from dedicated systems and integrate them with the machine's distributed controls, i.e., the much-discussed "single window" concept. More powerful microprocessors have contributed to this trend, and "open" architecture has allowed personal computers to be interfaced with control systems for easier data access.

Moisture CD controls continue to be the most justifiable in terms of their improvement of productivity and beneficial effect on other CD variables. Some 566 of these actuators have been put under control in the last two years. The second most prevalent actuator installation is the oldest CD application, caliper, with 352 installations since the last survey. Basis weight, the most complex control, is third, at 314 in the past two years. Overall, moisture is the most common CD control, followed by caliper and basis weight; total installations are 1,303, 1,000, and 776, respectively. For this and the other surveys, only those actuators reported sold and installed with control software were counted to avoid duplication of installations, i.e., Measurex (or AccuRay) control of an Impact (or Devron-Hercules) moisture profiler reported as a system installed by both companies.

NEW GLOSS ACTUATOR. Measurex still leads the industry with a reported total of 1,276 actuators under control through the end of 1988, with 396 installations in the last two years. Measurex has introduced several new actuators, including the InfraTrol electric infrared moisture profiler. The InfraTrol design is said to use control widths as narrow as 1 in. Control zone widths are tailored to each machine and can be varied across the sheet on a given machine.

The GlossTrol drip-free gloss control actuator is designed to be installed on each side of a supercalender for control of top and wire-side CD gloss. New software allows independent control of gloss for both sides of the sheet. Gloss spread reductions of up to 80% in 2-sigma variation have been reported for a system that has been in operation less than one year.

Measurex has also introduced the Caltrol II with VariZone, an enhanced version of its Caltrol caliper actuator. Caltrol II uses higher-wattage heating elements and greater airflow than the Caltrol I. Caltrol VariZone I features dual nozzles to provide additional power in areas where greater control is required, such as sheet

edges. VariZone II's variable nozzle spacing down to 1.5 in. allows the targeting of narrow streaks for higher-resolution profiling.

Measurex now markets the Eddy Current Automatic Moisture Profiler (ECAMP) for CD moisture control on yankee dryers. ECAMP, introduced by Beloit in the late 1970s, uses a series of staggered, low-current d.c. electromagnets mounted across the yankee dryer to selectively induce eddy currents in the dryer shell to generate localized heating for high-resolution moisture profiling.

Measurex will be introducing a number of CD control software enhancements in early 1989, including one package for "multiple-frequency actuator control." This software will optimize control of multiple actuators affecting the same sheet property but will act over different zones or in opposite modes (for example, a press-section steambox with 150-mm zones and a remoisturizing shower with 100-mm zones). Other packages include "enhanced profile computation" to reduce scan-induced CD and MD variance, "supercalender basesheet profile transfer" to provide feedforward information on the basesheet to the supercalender operator, and "enhanced caliper control," which is said to incorporate three separate software product developments. The multifrequency actuator control matches multiple-actuator capabilities (such as Caltrol and deformable rolls) with profile control requirements. The "heat transfer modeling" feature is said to provide inherent decoupling of adjacent control zones for faster, more stable control. And the AutoGain feature matches caliper control strategy to the unique conditions following a break or machine upset.

Measurex's version of profile-mapping software is its AutoLign Tracking program, which is said to precisely match profile measurement and control zones, regardless of web wander, control zone width, or nonlinear shrinkage of the web on the paper machine.

Measurex reports that no Measurex actuator is controlled by another vendor's software. It also says that 94% of its basis weight control systems use its Therma-Trol actuators, while 75% of its moisture profile controls and 48% of its caliper profiling systems use Measurex actuators. Measurex offers the single-window concept through integration of its paper machine MD and CD controls with its Vision 2002 distributed control system. A recent enhancement is the SuperVision system, which uses a 32-bit microprocessor (see related story, p. 80).

FIGURE 1: **Moisture actuators put under control by year.**

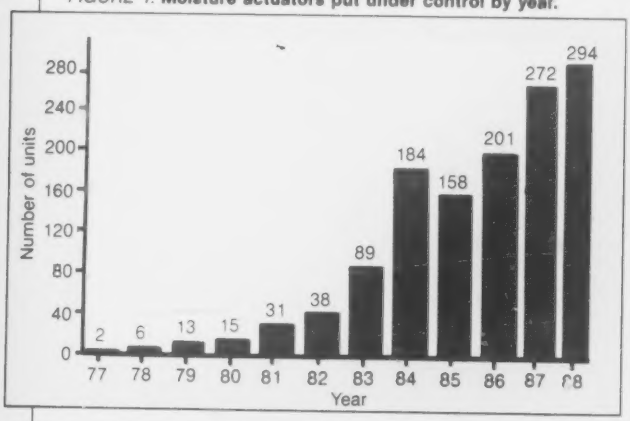
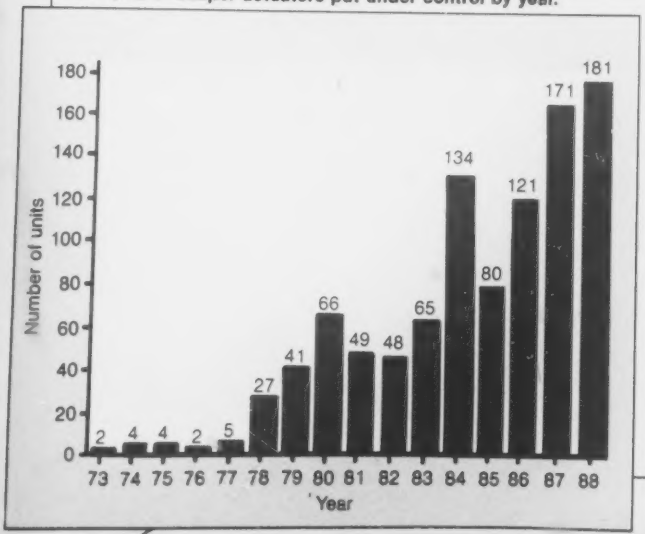


FIGURE 2: **Caliper actuators put under control by year.**



NEW MOISTURE PROFILERS. Combustion Engineering's Process Automation Business is second overall in total CD installations, with 890 of its AccuRay Profile Managers installed. AccuRay ran a strong second to Measurex the past two years. AccuRay first introduced its line of Microset actuators in 1986. Since then, the Microset Steam Profiler and Microset IR (infrared) Profiler, both for moisture control, have been added to the line. The IR profiler is electrically powered with a row of 5-in. heating modules, which are said to be able to control extremely small moisture variations. Up to four rows of heating modules can be mounted in a stainless steel, insulated drying hood. A recent installation reported an 83% reduction in the 2-sigma CD variation of a fine paper machine.

In 1988, the AccuRay 1180 MicroPlus single-window control system was introduced, and more than 30 systems have been sold. The 1180 MicroPlus is the integration of AccuRay measurement and actuation technology with MOD (formerly Taylor, now part of Combustion Engineering's Process Automation Business) distributed control systems. The 1180 MicroPlus features a universal gateway that enables communication with a variety of external control and process information equipment, including DEC VAX equipment and process level controls by Modicon and Allen-Bradley.

Enhanced signal processing capability is now offered with the 1180 MicroPlus as FirstSight measurement technology. This technology uses a 32-bit microprocessor. It reportedly allows a 960 data point, full-sheet profile, and 3,000 to 6,000 measurements per scan per sen-

sor to create high-resolution sheet profiles with streak detection as narrow as 10 mm. The first 1180 MicroPlus system with FirstSight technology has been sold to Fraser Paper Ltd., Madawaska, Maine.

The AccuRay version of profile mapping software is its ProMap control strategy. ProMap is said to be an enhancement to the AccuRay Profile Manager weight control module that correlates profile measurements with the control zone of each slice actuator. This enables the module to compensate for sheet wander and linear, nonlinear, and asymmetrical sheet shrinkage.

The AccuRay MicroScan caliper sensor line has been enhanced to include the following: contacting caliper sensor, single air-bearing caliper sensor, and noncontacting caliper sensor. More than 550 AccuRay caliper sensors reportedly have been installed.

C-E's Process Automation Business "closed the loop" on control of supercalender CD caliper with deformable rolls at Haindl Papier GmbH and Consolidated Paper Co. Inc. in 1985. The company has more than 18 supercalenders under caliper control. AccuRay air-water spray actuators and infrared profilers have been applied to 12 coaters to date for CD moisture and coat weight control.

HIGH-SPEED WEIGHT CONTROL. Impact Systems began as a supplier of infrared moisture profilers and claims more than an 85% share of that market. The company reports 548 actuators sold (not necessarily under control) and now offers complete CD control packages. Impact says that 83% of its actuators are installed with its control systems and software. Impact has introduced the Dyna-Step weight profiling system that uses high-speed stepper motor actuators for closed-loop control of the headbox slice. The stepper motor reportedly makes 200 steps/sec. The system also features Simul-Step, which allows all the actuators to move in parallel, increasing the speed of response during grade changes and upsets. To date, 12 of these systems have been sold.

For caliper control, Impact offers the Super-Jet and Ultra-Jet variable temperature, high-velocity jet impingement actuators. They are part of the Therma-Jet series but feature a higher maximum power input (14-kW/CD ft and 20-kW/CD ft). Temperature control range of the Therma-Jet series is reportedly 30°F to 70°F. To date, 12 Super-Jet systems have been sold.

Impact's Series II is a second-generation software and control package. The system includes a high-speed local area network developed by Impact specifically for CD control. Special control features include profile-to-actuator mapping, decoupling, and multiple-width control zones. The Series II software reportedly supports up to 28 microprocessor-based nodes, which allow the customer to add actuators, sensors, and operator stations without software retrofits and added engineering costs. Series II also provides a bridge to distributed control systems for flexibility and expansion capacity. Forty Series II systems have been sold to date.

In 1988, Impact introduced the Spectrum-IR, a gas-fired infrared profiling system. It features a burner of proprietary material that reportedly allows cool-down in under 2 sec—as fast as Impact's electric infrared system. Twelve of these systems have been sold. Impact plans to introduce the Aqua-Pac remoisturizing spray system in early 1989.

Impact entered the sensor business with the introduction of the rapid-scanning (RS) caliper sensor. The scanner can operate at 1.3 ft/sec and uses an air bearing to prevent sheet scratching. Four have been sold. The sensor unit can also be piggybacked with existing scanners. Impact markets a complete line of scanning basis weight, moisture, gloss, ash, and direct coat weight sensors manufactured by its Finnish subsidiary, Impact Oy. More than 32 of these systems are installed in Europe. Impact also has a nonscanning moisture sensor—the RT.

FIGURE 3: **Basis weight actuators put under control by year.**

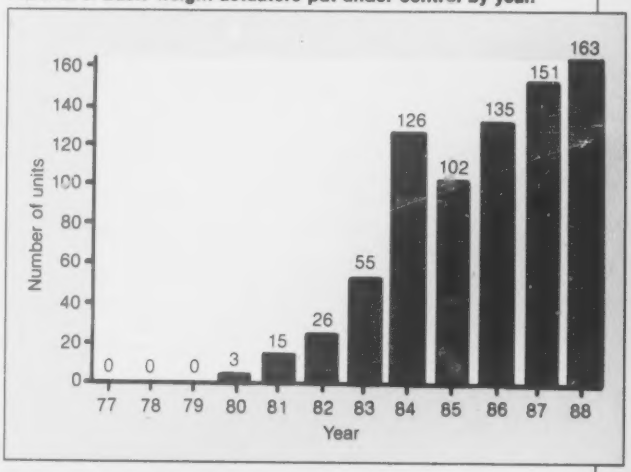
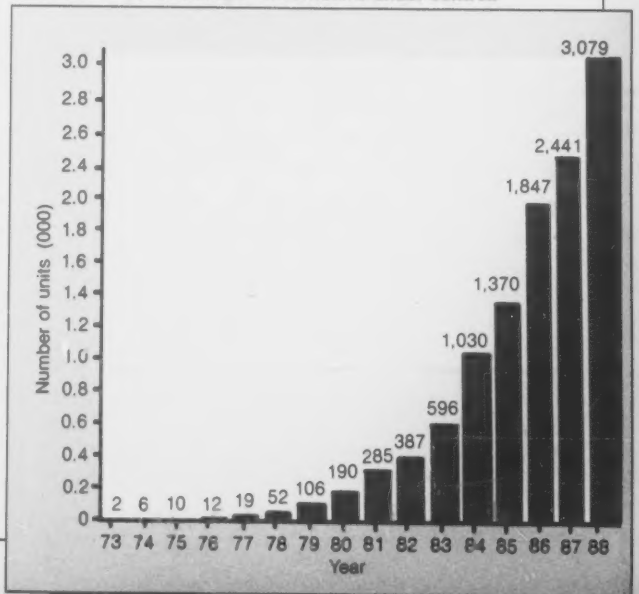


FIGURE 4: **Accumulation of all actuators under control.**



In 1988, Impact acquired Itronic Process AB in Sweden, which specializes in coating drying. Impact has both infrared profilers and Therma-Jet caliper actuators installed in coating applications for CD moisture and coat weight control. Results from using caliper actuators to change sheet smoothness at the calender stack (thus affecting coat weight pickup) based on measured bone-dry weight and coat weight profiles, have shown peak-to-peak profile variations reduced by more than 50%.

CLOSED-LOOP SOFTWARE OFFERED. Devron-Hercules continues as a very successful actuator supplier, with more than 1,000 sold by the end of 1988. The company introduced closed-loop software in 1987, and since then about 75% of its actuator installations (210 total in the past two years) have employed Devron-Hercules control software. The company has two new actuator offerings: the Calcoil II caliper control and the electric and gas Infradry moisture profiler. Calcoil II is said to have twice the power per heating zone of the original system, making it useful for supercalender caliper/gloss profile control. Thirty installations of Calcoil II and ten installations of Infradry are reported.

Devron-Hercules' latest closed-loop control system is based on its 386 ARCtech open system architecture using Intel 80386 microprocessor-based personal computers. All components are said to be standard and multisourced. Hardware, operating systems, communications networks, and programming languages are not proprietary. The HUMM (High-Speed Measurement Module) is offered to process signals directly from any existing scanner along a local area network to the Devron-Hercules control system. Advanced control algorithms such as mapping, filtering, and multiple-actuator control (MACtech) are also offered. To date, 70 closed-loop actuator control installations are reported. Devron-Hercules also reports that in 15 installations, it has integrated CD control into distributed control systems, including the Bailey Network 90, Foxboro I/A, Honeywell TDC 3000, and Fisher Provox.

Devron-Hercules reports 20 installations of the Calenderizer steam shower for control of gloss/smoothness and five installations of the Calcoil to control surface finish prior to coating operations.

Valmet Automation has integrated the CD control products of Sentrol and Wartsila into its offerings since 1987. The company reports a total of 171 CD actuators under control. CD weight installations include the Valmet Jetmatic and Sentry Optiprofile, both of which utilize algorithms developed by the Swedish Forest Research Institute (STFI) in Sweden. Valmet has acquired IRT, maker of an electric infrared profiler, and this equipment is offered by Valmet Automation. The company also reports ten supercalender CD control applications. It offers the QCS supercalender control system, which involves simultaneous control of moisture, caliper, and gloss profile.

V.I.B. Systems reports a total of 1,365 installations worldwide. V.I.B. has introduced a segmented profiling steambox, the System SC Turbo Steam Profiler. Through its three separate steam application zones, the Turbo Steam Profiler reportedly allows both moisture profiling and production increases.

Beloit has introduced its Profiling Air/Steam box with segmented compartments and double-acting valves to apply a mix of air and steam at each CD zone. It reportedly offers sharper profiling than other steamboxes.

Thermo Electron Web Systems reports 18 CD actuator installations in the past two years and a total of 186 overall. The company has aggressively pursued the application of its Steam Foil actuator to soft calenders, calenders, and supercalenders for gloss/smoothness and caliper control and reports ten installations. Approximately 10% of its installations are controlled by systems and software developed by the company.

THE FUTURE. The CD control market still seems far from saturated. One company estimates that currently less than one-half of the paper machines in the U.S. have CD controls installed and, on average, there are only 1.2 actuators per machine. Another supplier says that only 10% of all paper machines worldwide have total CD control (weight, moisture, and caliper), and only about 20% have either weight or caliper. About 30% of all machines are estimated to have CD moisture control. Another company estimates the potential for 70% of the world's paper machines to have four CD actuators and controls installed. In addition, the market for CD control in the converting area remains virtually untouched. Future actuator development efforts will focus on gloss, smoothness, and possibly formation.

The move away from dedicated control systems will continue with the integration of paper machine controls into the distributed systems. More powerful microprocessors will allow sophisticated algorithms to be implemented. More emphasis will be placed on improving overall sheet quality and coordinating the effect of multiple actuators rather than controlling individual loops.

Access to sensor signals by actuator suppliers could be a sore point as the "single source" and "open architecture" philosophies clash. As one actuator supplier says, "License fees, electronic gamesmanship, software mazes, and the threat of warranty cancellation are but some of the tactics that are used by gauging vendors to 'protect' profile information that the customer already owns. If the industry can open up the channels to this information, the profiling controls business will grow more rapidly, offering a wider variety of innovative products at more competitive prices." Another vendor offers a conflicting view, "An actuator by itself and of itself is no guarantee of performance. It takes the comprehensive integration of the actuator, the control software, and the operator interface to ensure that the perceived expectations are realized." ■